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Singapore

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TO

HENRY NICHOLAS RIDLEY, C.M.G., F.R.S.,

who as Director, from 1888 to 1912,
gave to the Botanic Gardens their scientific reputation; and also to the memory of

MAJOR-GENERAL SIR W. ORFEUR CAVENAGH,

who, during his service as Governor of the Straits Settlements (1859 to 1867), did all that he could unofficially to establish the Gardens; of

JOHN EARN MACDONALD and EDWARD JOHN LEVESON,

merchants, and successively Honorary Secretaries and Treasurers of the Agri-Horticultural Society of Singapore, which found funds for their early growth; of

LAWRENCE NIVEN,

planter, who laid them out for the Society; of

JAMES HENRY MURTON,

the first Superintendent under the Government of the Straits Settlements, for his vigorous planting in them; and of

NATHANIEL CANTLEY,

Superintendent from 1880 to 1888, as having been the originator of much that is good in their internal organisation,

this guide-book is dedicated by its author, I. H. BURKILL.

Date published [1927]

THE MAIN GATE ROAD

THE Main Gate Road has, reversed, the curves of an S. Starting from the gate, which gives to it its name, it reaches and skirts the Lake, and thence climbs the Bandstand Hill. In its first part, where it is between Lawns A and B (see the map), it is bordered by large rectangular beds for which Cannas have been found appropriate. In its second part it has many economic trees near to it; and in its last part it is among palms.

The Garden Canna of to-day is very much hybridised, and its history is interesting. Seventy years ago the Cannas in cultivation were races of *C. discolor*, the shortest 6 ft. high and the tallest even up to 12 ft., their flowers small, but compensated by the prettiness of their bronzed foliage. Dwarfing was obtained in 1862 by the sporting of a plant in Paris, which, out of a bed of tall plants, grew to no more than 4-5 feet. This plant a French botanist preserved, and having, in the next year, crossed the Peruvian *C. iridiflora* (6-8 ft. high) with the Brazilian *C. Warszewiczii* (3 ft. high), he intercrossed the results with his dwarf mutant, creating in this way the first "French Cannas." Subsequently an Italian horticulturist took *C. iridiflora* again, and crossed it, not with either of the species incorporated into the first French Cannas, but with the full-flowered Florida *C. flaccida*, which is itself under 3 ft. in height. This cross gave the "Italian Canna." Professor L. H. Bailey has put forward the name *Canna generalis* for the French Canna, and the name *C. orchiodes* for the Italian Canna; but both are crossed into each other now to such an extent that there is no line of separation left, by the use of which the two names can be applied.

Behind the Canna beds on Lawn A stand two clumps of the Sago Palm, *Metroxylon Sagus*. The trunks arise as sucker shoots from an under-



THE MAIN GATE. [*Photo by G. A. Best.*



THE MAIN GATE ROAD WITH THE CANNA BEDS. [*Photo by G. A. Best.*

ground stem, and after growing for about 15 years flower. Commercial sago is the starch extracted from the very soft inner wood of these trunks just before the time of flowering, the starch being the palm's store of food against the drain resulting from seed-production, although it is a peculiarity of this palm, without explanation, to produce almost invariably infertile seeds. To win the starch, the ripe trunk is felled ; and the inner wood is rasped fine enough for the starch to be freed. This starch is washed, and washed again, until clean, when by gentle heat it is granulated into the various forms that find a sale.

Lawn A bears by the Gate, along with the Sago-palms, a tree of the Venezuelan *Brownea ariza*. Then, a little further up, first a tree of *Brownea capitella* ; then a tree of the Indian *Saraca declinata*. The rose flowers of the Browneas make them exceedingly beautiful ; and they, along with Saraca, are interesting, as exhibiting the tender sun-shy reddish young foliage so frequent in the Tropics. The genera Brownea and Saraca belong to the large family Leguminosae, which is illustrated chiefly upon Lawn F.

There is a clump of Traveller's Tree, *Ravenala madagascariensis*, near the Browneas. Its large leaves suggest a Banana plant, but they are in two rows on a genuine trunk, whereas the Banana supports its leaves, which are in many more rows than two, upon a false trunk made by the inrolled leaf-stalks. The stalks of the leaves of Ravenala so overlap that a chamber is constructed between each two, with for sides the leaf-stalk below and the trunk, and for a lid the leaf-stalk above ; and in this chamber rain-water collects, entering by such a narrow opening that it is kept pure. If the lower leaf-stalk be cut this water runs out ; and it can be drunk. The natives of Madagascar prefer, it is said,



SAGO PALMS. [*Photo by R. E. Holttum.*



THE TRAVELLER'S TREE.
Ravenala madagascariensis.

[*Photo by R. E. Holttum.*

to drink water from the Ravenala trees than to resort to a stream. The stems make their house-walls and the leaves make the thatching to such a great extent that for " Traveller's Tree " one might with justice substitute the less picturesque name of " Builder's Tree."

One of the oldest of the African Oil Palms that the Gardens possess is upon this Lawn. It is not of a good commercial type, for the races which have been longest in the East are not.

Near it are two grafted Rubber Trees, *Hevea brasiliensis,* the grafts having been taken from a certain very desirable tree, which was raised in 1884, and found to be the best " milker " in the old Economic Garden.

At one period in the history of the Gardens, a road diverged northwards towards the Bandstand Hill, from the Main Gate Road at the Gate; and traces of it persist. The spreading Rain-tree, *Samanea Saman,* which almost touches the Gate, and the pendulous-branched Nutmeg, *Horsfieldia sylvestris,* behind it, were planted at the side of this road; then, in 1884, it was narrowed to a path and a double row of Araucarias planted along it.

The Rain-tree is a native of the northern parts of South America, whence it was early carried round the World; and for two centuries it has been in favour as a quick growing shade-tree. It is said that its curious name came from a habit of putting out new leaves with the coming of periodic rains, but where and when is not known; also that its leaves fold when rain is approaching; and it is by others stated that it came from the falling of honey-dew excreted by certain insects, which, in the West Indies, feed on it. Its leaves fold; but that is a sleeping position assumed at night.

Horsfieldia sylvestris is a wild nutmeg of the eastern islands of Malaysia, which prunes itself in a very striking manner, branches of even ten feet in length being thrown off. Another wild nutmeg, *Myristica bivalvis*, is to be found on Lawn B. Neither of these is economic.

The Gymnosperms (that is, naked-seeded plants), which the Gardens possess, have been collected, as far as possible, into the neighbourhood of the Main Gate, and extend through the south-eastern part of the Gardens, between the Gate and the Bandstand Hill. Exceptions are that certain species of *Gnetum* exist wild in the Gardens' Jungle, and that a group of Cycads has been placed upon the side of the Palm Valley on Lawn X because the caterpillar of a little blue butterfly effects such extensive damage to them as to make some scattering necessary.

The families of the Gymnosperms are represented in the Gardens as follows :—(1) the *Podocarpaceae*, by *Dacrydium elatum*, which is growing upon Lawns B, C and O, in several individuals, and is already about 50 ft. high ; and by several species of *Podocarpus*, e.g., *P. polystachyus* (Lawns B, D, J and O), *P. imbricatus* (Lawns A, C, D and O), *P. macrophyllus* (Lawns B and Z), *P. maki*, which is best considered as a sub-species of the last-named (Lawn X), and *P. neriifolius*, in tub-culture ; (2) the *Araucariaceae*, in the genus *Araucaria* by trees, some of them now about 80 ft. high, of four species, being *A. Bidwillii* (on Lawns B and C), *A. Cookii* (on Lawns A, B and C), *A. Cunninghamii* (on Lawns B, C and D), and *A. excelsa* (on Lawn C) ; and in the genus *Agathis* by trees of similar height of *A. vitiensis* (on Lawns B, E, Z, and near the Assistant Curator's house) and perhaps of *A. robusta* ; (3) the *Taxodiaceae*, which is the family of the giant Sequoias of California and the magnificent Cryptomerias of Japan, only by *Sciadopitys verticillata* (in tub-culture and kept alive with great difficulty) ; (4) the *Cupressaceae* or family of the cypresses and junipers, by *Cupressus funebris* (on Lawn J), *Thuja orientalis* (on Lawn D), *Juniperus conferta* (on the Sun-Rockery), and *J. chinensis* (on Lawns B, C and D), and further by *Cupressus torulosa* (in tub-culture) ; (5) the *Cycadaceae*, by specimens of fair size of *Cycas Rumphii* (on Lawns D, L, W and X), of *C. siamensis* (on Lawns D and X),



ARAUCARIA COOKII. [*Photo by R. E. Holttum.*



CYCAS RUMPHII. C. SIAMENSIS. [*Photo by R. E. Holttum.*



ENCEPHALARTOS HILDEBRANDTII. [*Photo by R. E. Holttum.*

of *Macrozamia Hopei* (on Lawn D), of *M. Denisonii* (on Lawn O), of *Encephalartos Hildebrandtii* (on Lawn X), of *Zamia pumila* and *Bowenia spectabilis* (on the Sun-Rockery); (6) the *Gnetaceae*, by *Gnetum Kingianum* and *Gn. campestre* in the Gardens' Jungle.

The following families are not represented in the Gardens :—the *Taxaceae* or yews, the *Cephalotaxaceae*, the *Pinaceae* or pines, the *Ginkgoaceae*, the *Ephedraceae*, and the *Welwitschiaceae*. Prolonged attempts have been made to keep alive the Ginkgo and several species of pines, but with no real success, not even with *Pinus Merkusii*, which occurs in Burma, Siam, and the mountains of Sumatra. The *Taxaceae* and *Cephalotaxaceae* have been subjected to considerable experimentation. The *Ephedraceae* and *Welwitschiaceae* are desert plants, and success with them cannot be expected.

The species found amenable to cultivation in the climate and soil of Singapore may be classified into nine groups, as follows :— (1) there are those completely at home in the high forest of the lowlands of the Malay Peninsula, and for that reason at home in the Gardens, *e.g.*, *Gnetum Kingianum* and *Gn. campestre ;* (2) there is *Gnetum Gnemon*, an eastern Malaysian tree widely spread by cultivation ; (3), there are certain trees of the mountains of the Malay Peninsula from 2,000 ft. upwards, which, competition being removed as in the Gardens, thrive, *i.e.*, *Dacrydium elatum*, *Podocarpus neriifolius*, and *P. imbricatus ;* (4) there are trees of the neighbourhood of the shores of the Peninsula, and of cliffs in the interior, that is to say, of places where the high forest cannot reach its full development, *i.e.*, *Podocarpus polystachyus* and *Cycas Rumphii ;* (5) there is *Encephalartos Hildebrandtii*, which is found along the eastern coast of Tropical Africa, and what is believed to be *Podocarpus gracilior* of Uganda and Abyssinia ; (6) there are trees from the shores of Queensland, New Caledonia and adjacent islands, which grow, but remain sterile, *i.e.*, *Bowenia spectabilis*, *Araucaria Bidwillii*, *A. Cookii*, *A. Cunninghamii* and *A. excelsa* ; and also *Macrozamia Hopei* and *M. Denisonii* which produce fruits ; *Agathis vitiensis* may be added to this group, as well as *A. robusta ;* (7) there are trees not uncommon in Central China, for instance in the province of Hupeh, as *Cupressus funebris*, *Thuja orientalis* and *Juniperus chinensis*, and these, like the first four in group 6, remain sterile ; (8) there is *Juniperus conferta*, which has its home upon the sand-dunes of Japan and in the Liu-kiu islands ; in the Gardens, given a place where it receives heat from a pavement, it grows well ; and (9) there is *Zamia pumila* of the West Indies.

The other Gymnosperms possessed by the Gardens, such as can be maintained in tub-culture, are found to perish slowly if planted out, and a review of the whole group leads to a very emphatic conclusion that climates such as that of Singapore, which are found upon the Equator, scarcely support the living Gymnosperms. One may reasonably conjecture that the Gymnosperms, whose fossil remains occur in the rocks, probably lived under climates less uniformly warm-humid.

In their own home, the Araucarias attain 200 ft. ; but sufficient time has not elapsed since their planting in Singapore for such a size to be attained ; moreover, in the Malay Peninsula it happens very frequently that trees fall and so succumb before an attack by white ants, as soon as an injury breaks through the outer resinous parts of their roots.

Upon Lawn B the Casuarinas are collected. There are half-a-dozen beautifully shaped trees of *Casuarina sumatrana*, two young trees of the closely related *C. Rumphii* of Amboyna, and two trees of *C. equisetifolia*, which species is found on sandy sea shores from the Bay of Bengal to the Marquesas Islands. The Australian *C. glauca* is on Lawns C and D. *C. sumatrana* is native on the mountains of Sumatra and Borneo. The Gardens' trees, which are now rather more than 50 years old, have retained branches to the ground, though, as found in Borneo, when growing among competitors, and doubtless also in Sumatra, they stand like firs, with clean naked trunks and an umbrella-top. It is expected that *C. Rumphii* will grow as *C. sumatrana* does. *C. equisetifolia* and *C. glauca* acquire



DACRYDIUM ELATUM. [*Photo by E. H. Wilson.*



CASUARINA SUMATRANA. [*Photo by E. H. Wilson.*

a shape more poplar-like and the latter in the climate of Singapore dies at the branch-tips, while trying to make good by sucker-shoots, for, in common with several other tropical Australian plants, it finds the climate here only just supportable. The behaviour of Australian plants in general shows in how great a measure the plants of that continent are prevented, by the moist heat of Malaysia, from migration towards Asia.

At the turn of the road near to and almost facing the Lake is a good tree of the Waringin, *Ficus Benjamina*. Opposite to it, upon the end of Lawn A, is a tree of the Japanese Camphor, *Cinnamomum Camphora*. This useful plant thrives better in a cooler climate than Singapore has. In eastern China and southern Japan, where it is native, it attains its full growth in 40-50 years, but lives, it is estimated, to 1,000 years. At such an age the trunk may be 20 ft. through ; but very large trees are rare, and it is considered well grown if 2-3 ft. through. *Cinnamomum Camphora* has been in the Singapore Gardens for nearly 50 years, but the bush at this spot is about half that age, yet very undersized. Camphor is found in the wood of old trees, here and there in lumps, but only a small part of that in commerce is so obtained ; the greater part is won by distillation of the wood and of the leaves—even of fallen leaves.

Near the Camphor tree is a pleasing specimen of the Australian *Buckinghamia celsissima*. It has not attained in fifty years the 60 ft. and over which it reaches in northern Queensland ; and it has never seeded, though it is frequently in flower. As an Australian plant of the coastal regions of Queensland, it behaves like the Australian Podocarps and Araucarias, mentioned above, supporting the moist heat of Singapore without being fertile.

A runnel carries off water from the Lake just beyond these trees, and on the further side of it, overhanging the Lake, is a wide-spreading fig tree, *Ficus Kurzii*, abundantly supplied with aerial roots. Behind it are small examples of the two chief mahoganies—*Swietenia Mahogani* of the West Indies, and *Swietenia macrophylla* of Honduras.

Mahogany is the premier cabinet wood of the World. Whereas true mahogany is the wood of four or five American trees, the timber trade has extended the use of the name to other somewhat similar woods from various unrelated sources. True mahogany was used for ship-building and repairing by the Spanish conquerors of America, and in Britain at the time of Queen Elizabeth it was already recognised as a cabinet wood, Jamaica slowly acquiring an export trade in it. When the Jamaican internal supply no longer met the demand, Honduras timber was shipped, through Kingston, to supplement it. About fifty years ago, in consequence of the cultivation in India of both trees, the discovery was made that the Honduras plant is not a different variety but a different species. As it inhabits a moister and more uniformly warm climate than Jamaica has, it grows better in Singapore ; but both species have had extensive trials in the Malay Peninsula, and neither with real success.

The rattan growing into the Ficus is *Calamus Scipionum*, the chief source of the Malacca cane, which has been an article of export to Europe since the 16th century ; it is also in demand locally for the stouter parts of baskets used in the tin mines.



THE GARDENS' LAKE FROM THE UPPER END. [*Photo by Lee Bros.*

The Lake covers a little less than four acres. By preventing the weeds in it from reaching the surface, and the weeds on its banks from spreading inwards, that is to say by keeping the water open, its fish are enabled to destroy any mosquito larvæ that happen to hatch out from eggs deposited in it. The submerged weeds are chiefly *Chara gymnopitys, Blyxa malayana* and *Enhydrias angustipetala.*

The Lake is planted with Water Lilies. The white and the rose lilies are *Nymphæa Lotus,* chiefly in its variety *pubescens ;* the blue is *Nymphæa capensis*—the type as well as its variety *zanzibarensis ;* and the lemon-yellow is *Nymphæa mexicana.* The white surely deserves the appellation of the " Lady Virtue " given in Chinese classics. *N. Lotus* was a temple flower with the ancient Egyptians, and is still so among the Burmese buddhists.

These three species of Nymphaea belong to as many different sections of the genus, and the sections will not inter-cross. At the same time hybrids made within the sections tend to be sterile, and, therefore, when planted in the Lake as they have often been, they die out before the very fertile *N. Lotus. N. Lotus* opens its flowers about night-fall, closes them during the following morning, to open again once more for another night. *N. capensis* and *N. mexicana* are day-flowering, having their flowers open from the forenoon until the late afternoon.

Victoria regia is also in the Lake. It is the largest of all the water-lilies, and its flowers may exceed 12 inches in diameter. Their beauty is great ; so that the traveller Bonpland, in excitement, all but threw himself into the Amazon for them at first sight, and the botanist Haencke went on his knees to them. The annual floods of that great river bring down rich silt ; and so nourished this plant thrives in its back waters. The wide leaves have a free-board edge and possess defending prickles below.

On the islet in the Lake are seen conspicuously a Siamese Screw-Pine, *Pandanus kaida* and the Malayan Palm, *Oncosperma tigillaria,* with tree-ferns and *Hedychium.*

The slopes above the Lake carry economic trees, several of which were planted soon after the foundation of the Gardens, in 1859. A photograph taken in 1878 shows these slopes with abundant coconuts, in addition to what is present now. On the bank over the water stand two mango trees, *Mangifera indica.* On the other side of the road are trees of the rambai, *Baccaurea Motleyana,* the durian, *Durio zibethinus* and the mangosteen, *Garcinia Mangostana.* With the idea of increasing the economic interest of this part of the Gardens, the sides of the road as it ascends from the Lake-side have been planted with other useful plants. The palm with large leaves held edgewise to the light is *Attalea cohune,* whose oily seeds serve, upon the upper Amazon, to make the greasy smoke with which " fine hard Para rubber " is cured. A triangle of trees is passed on the left and immediately beyond stands a tree of *Melaleuca Leucadendron,* the leaves of which yield cajeput oil. The flaky bark is the usual material from which, with the aid of dammar, the Malays make torches. Opposite is a young tree of *Pistacia formosana,* a timber tree of the island which gives it its name ; facing it is the Levantine *Pistacia Lentiscus,* which in its variety *mutica* yields Chian turpentine.



THE GARDENS' LAKE FROM LAWN F.

Ficus Benjamina.

Mangifera indica.

[*Photo by Mrs. I. H. Burkill.*

Oncosperma tigillaria.
Pandanus kaida.

Further economic bushes are :—(1) *Gossypium brasiliense*, the Pernambuco cotton. It was very common on the tropical coasts of Brazil when European trading vessels first visited them, and the length of its silky floss raised great hopes, so that it was soon carried both to Europe and to the Portuguese settlements in the East. It is the cotton most tolerant of the climate of Singapore ; but, unfortunately, in spite of successive experiments, it has found no place in field-culture. (2) *Lonchocarpus cyanescens*, the Yoruba indigo, is a dye plant of West Africa, and its colouring matter is indigo ; but there is rather less of it in the plant than in species of Indigofera. (3) *Bixa Orellana*, the Annatto plant, the seed-coats of which give a yellow dye formerly used by the Indians of tropical America as a paint for their bodies, and by the more cultivated peoples of Mexico as a colouring matter for their beverages made from Cacao. It came into use in Europe for colouring butter and cheese. (4) *Hæmatoxylon campechianum*, the Logwood, which grows in Mexico, Yucatan and the West Indies. It gives the purple-dyeing wood familiar in trade. Though a tree of 40 ft. in height, it is possible to clip it into a hedge. (5) *Uncaria gambier*, the Gambier bush. Gambier is a tan, extracted by boiling from the leaves of this bush ; it is used for chewing along with betel, as a medicine both in the East and in Europe, and more rarely for tanning leather. It is said the Malay name Gutta Gambir is a corruption from the Tamil ; and this suggests that just as natives of India brought, not the sugar cane, but sugar-making from that country into Malaysia, so they brought, not the Gambier plant, but the art of making Gambier, in imitation of cutch-making as practised in India. Under modern conditions, Gambier-boiling only pays with very cheap fuel ; and the industry, which is in the hands of Chinese, wanders with the attack of man on virgin forest ; it was in Borneo in 1758, and was thence brought into the Malay Peninsula. If the natives of India started the industry in Malaysia, the Javanese or Sundanese must have made Gambier for them in Java ; but of this we possess no indication. We know, however, that in the 17th century the Javanese grew the plant that they might chew the leaves, as they still do. (6) *Tamarindus indica*, the Tamarind, the pods of which are widely used as a condiment, and the seeds as an astringent medicine. (7) *Ilex paraguayensis*, Maté or Paraguay tea, a bush extensively grown for tea-making in South America. (8) *Camellia theifera*, the true tea bush. The first growing of the tea bush by Chinese is prehistoric. It was experimentally grown in Penang in 1802 and in Singapore in 1822 ; but allowed to die in both places. Between 1821 and 1826 it was discovered that a variety of *Camellia theifera* grew wild in the parts of India contiguous to China ; and this was both brought into cultivation, and crossed with the smaller leaved China tea, giving the hybrid with which tea-cultivation commenced in India, and extended to Ceylon after the failure of coffee there. In 1878 the hybrid was introduced into Singapore and grown in the Gardens, and produced for a time an industry on a small scale, maintained up to 1908, when rubber-planting opened more profitable avenues. (9) *Cola nitida*. The home of Cola is West Africa, where it takes among the natives the place that tea has in China or coffee in the Levant. The nuts began to come into Europe in the 16th century. Their tonic effect is now well known and there is a steady import.

Adjoining these economic plants, the Gardens' collection of Hibiscus is arranged. When Europeans first sailed the Pacific they found *Hibiscus Rosa-sinensis* in cultivation in races with flowers that were rose or white, and later in China a race with yellow flowers ; and these races were brought into hot-houses in Europe. The subsequent



ATTALEA COHUNE, the Cohune Palm of the Amazons. *[Photo by E. H. Wilson.*

exploration of tropical Africa led to the discovery of *Hibiscus schizopetalus* and to its introduction into Europe, where it and races of *H. Rosa-sinensis* were crossed. There was discovered, also, a *H. liliiflorus* in Mauritius, which was intercrossed with *H. Rosa-sinensis*. Moreover, the Hawaiian Islands contain several indigenous species of the genus ; and, beginning in 1892, some of these have been crossed, in most cases with success, into the complex arising from the earlier crossings of *H. Rosa-sinensis*. The result has been the raising of garden plants of great beauty, with flowers of a wide range of colours and of increased size. The Hawaiian *H. waimeæ* is present in the Gardens' collection. There are also present two species which refuse to cross with the others. They are *H. mutabilis* and *H. syriacus*. *H. mutabilis* is known in three races ; in one the flowers are white, in the second rose-coloured, and in the third (the cause of its Latin name) they open white and fade rose-coloured. *H. syriacus*, despite its name, is doubtless of origin in northern China or near thereto ; it has bluish flowers, stands the winter in the open air in the south of England, and grows badly in Singapore.

At the top of the ascent is the beautiful *Amherstia nobilis*, and opposite is the last remaining tree of an old avenue of the weeping cypress, *Cupressus funebris*, mentioned on p. 9.

Amherstia nobilis was discovered by botanists in 1826, as a tree cultivated around monasteries in Tenasserim, and was brought into the gardens of Europeans in the tropics. It attains 40 ft. in height. It is difficult to propagate, and in Singapore is very sparingly fertile.

Swartzia pinnata, Cassia Fistula, Cassia multijuga, Adenanthera pavonina and *Peltophorum ferrugineum*, of the same family, have been planted as near as possible, upon Lawn J.

THE DELL PATH

This is the path which curves round the lower end of the Lake, and passes along its western side to end in the Dell. The Lawn through which it runs is known as Lawn F ; it was a paddock for deer before its planting in 1890. It is now one of the chief homes in the Gardens of the family Leguminosæ ; but on account of the suitability of the waterside for certain trees, space has been found in it for other plants. Upon the dam of the Lake is a young tree of the beautiful *Ficus irregularis* ; and a little further on is a large tree of the Bengal Almond, *Terminalia Catappa*, whose falling red leaves, when their appearance coincides with the opening of the lilac flowers of an adjoining *Jacaranda ovalifolia*, make a beautiful effect. The latter is a native of southern Brazil and the Argentine. The Bengal Almond is one of the few trees in the Gardens which exhibit the phenomenon, so familiar in temperate climates, of reddening autumn leaves. Its seeds are delicious to eat, but are hard to extract from their fibrous covering. Near it is a small pandan, and then a vigorous tree of *Adinobotrys atropurpureus*. Just beyond these is a group of young trees, containing the Chaulmugra of Assam, or *Gynocardia odorata*, the Kalaw of Burma, or *Taraktogenos Kurzii, Hydnocarpus castanea* of the Malay Peninsula, and the Krabao of Siam, or *Hydnocarpus anthelminthica*. These trees carry in their seeds chaulmugric acid, which is a remedy for leprosy.

On the bank of the Lake is a young double coconut palm, *Lodoicea seychellarum*.

The following members of the family Leguminosæ are represented upon the Lawn:—(1) *Adinobotrys atropurpureus*, a tree of the



LODOICEA SEYCHELLARUM, the double-coconut. [*Photo by Lee Bros.*

Malay Peninsula ; (2) *Detarium senegalense,* an African tree, which yields a substitute for mahogany as well as fruits that can be eaten cooked ; (3) *Pterocarpus indicus,* the Burmese Padouk, which has a valuable timber ; (4) *Parkia speciosa,* the Petai, with pods beloved by the Malays as a seasoning ; (5) *Albizzia Lebbek,* which is the chief roadside shade-tree of the Levant ; (6) *Cæsalpinia coriarea,* the pods of which are the commercial tan, Divi-divi ; (7) *Hymenæa courbaril,* a South American tree, which seems to produce its hard timber at an unusually rapid rate ; (8) *Pithecolobium ellipticum,* a tree of Malaya, with saponin in its bark to a sufficient extent for it to be used as a fish-poison and as a hair-wash ; (9) *Andira jamaicensis,* a pretty bush of the West Indies, Brazil, and the Guinea Coast of Africa, a member of one of those interesting American genera which cross the Atlantic ; (10) *Gliricidia maculata,* another American bush, of great beauty when it flowers well, which came to the East across the Pacific at the hands of the Spaniards in the eighteenth century because it was useful for shading cacao ; (11) *Saraca indica,* the Asoka tree of the moister parts of India, a sacred tree and much used medicinally ; (12) *Brownea macrophylla* ; (13) *Pentaclethra macrophylla,* an African tree, the oily seeds of which are eaten. and have been tried in the mills of Europe ; (14) *Bauhinia semibifida,* a local climber, now getting rare in a wild state ; (15) *Derris elliptica* and (16) *Derris malaccensis,* sources of tuba. Tuba root grated has for ages furnished to primitive man in Malaysia a material for stupefying fish so that they may be caught. It is also used sometimes in arrow poisons. But it would seem to have been immigrant Chinese who adopted it as an insecticide ; and through them it has come into European use.

Eight of the sub-families of Leguminosæ are represented thus on Lawn F ; and seven more are represented in other parts of the Gardens. It has been found impossible to grow any of the Australian Podylirieæ, of which 36 have been tried, the north-temperate Loteæ and the Trifolieæ, except *Parochetus communis,* which can be kept alive in a pot.

Near the Dell end of the path, the visitor will find the following Dipterocarps :—*Balanocarpus Hemsleyanus, Isoptera borneensis* and *Dryobalanops ovalifolia.* If they continue to grow well they will form considerable trees ; they are natives of the Malay Peninsula. The most interesting of them is *Isoptera borneensis,* because its seeds yield tenkawang fat. It is found on river-sides from Sumatra to the southern Philippines. Its fruits are produced at irregular periods in large quantities, and floating, can be swept together on the water with ease ; if collected and crushed before rancidity sets in, a pleasant tallow-like fat is obtained, for which the demand is greater than the supply. *Dryobalanops ovalifolia* is the Keladan of the Malay Peninsula, and is a close ally of the tree which yields Bornean Camphor.



IN THE DELL.
On the left, a wall covered by Ficus repens and Vitis discolor.
In the centre, Cibotium Barometz.

[Photo by Mrs. I. H. Burkill.



FERNS IN THE DELL. [*Photo by Mrs. I. H. Burkill.*

THE DELL

This delightful corner of the Gardens has been constructed around the stream which feeds the Lake. The stream enters the Gardens through a small rectangular pool, passes under a rockery into a larger irregular pool and by a channel opens into the Lake. The rockeries are allotted to different groups of plants; one is largely covered with Begonias, another with Aroids and a third with Acanths.

A wall in the middle is covered with *Ficus repens*. At its end is the fern *Cibotium Barometz*, the silky hairs of which are used for staunching a flow of blood.

Sanchezia nobilis may be seen here. It is one of the American plants which are fertilised by humming birds. In Singapore no suitable flower-visitors exist to pollinate it; the Malayan Sun-bird having too short a bill.

Several of the trees in the Dell have an interest of their own. The tree of *Ficus polysyce*, close to the water, is covered twice a year with a surprisingly big crop of green figs, which neither the monkeys nor the squirrels will eat, and which, dropping off, completely cover the ground to the depth of several inches; and out of this abundance there come only one or two seedlings—an illustration of the frequent prodigality of Nature in her attempts at reproduction. The fruits are borne on the trunk and thicker branches, as is not uncommon in the tropics, the phenomenon being called cauliflory. *Ravenala guianensis* and *Metroxylon Rumphii* grow close to the water. This Ravenala is interesting as coming from the New World, whereas the only other species, which has already been mentioned, comes from Madagascar. In the centre of the Dell, the small tree with willow-like leaves is *Elæocarpus salicifolius*.

The big trees shading the Dell on the north are *Cedrela guianensis* and *Samanea Saman* (*Pithecolobium Saman*). The latter bears, in quantity, the aroid *Rhodospatha filamentosa*. The thicker stems of the aroid climb by their roots up the tree trunks, then give rise to slender stems, which have no rigidity, but hanging, reach the earth, where, if they succeed in rooting, they give rise to another stout well-fed stem that climbs the nearest vertical object.

Smaller trees in this group are :—*Filicium decipiens, Pittosporum ferrugineum,* and *Flacourtia jangomas.*

THE LAKE-SIDE PATH

The Lake-side Path runs an approximately direct course from the Main Gate Road, in its second section, to the Six-ways, skirting the upper part of the Lake and the Dell, and passing between Lawns P and S. Near it at the Lake end are *Canarium rufum, Warszewiczia coccinea* and *Dendrocalamus pendulus*. The Canarium has a fruit in composition like the Kenari nut, but too small to serve as a table nut. The Warszewiczia is a pretty climber of Trinidad. The Dendrocalamus is a very graceful bamboo of the Malay Peninsula ; it hangs out over the water.

The big trees nearby are *Eugenia grandis*. This species was adopted in Singapore in the seventies as the chief road-side shade-tree, at a time when the roads in the island were bordered by miles of waste grass-land. Long stately avenues were then produced, but they have become broken now.

Hibiscus mutabilis occurs bedded by the side of the path ; and a little beyond it a lesson in geographic botany is given by the smallness of two trees, one *Sapindus mukorossi,* the Soap-nut, and the other, *Machilus nanmu,* the Chinese Coffin tree. Both are at home in south-western China, and the former, by cultivation, has been extended across northern India and into Japan. Their poor state indicates how widely our climate differs from that which suits them.

THE OFFICE RING ROAD

The Office Ring Road is a loop which, taking off from the Main Gate Road, circles round the newer Office Buildings and joins the Office Gate Road. Formerly in the centre of the loop were the Monkey Houses ; and shading trees were planted about them which still persist. Where the western half leaves the Main Gate Road there stands the bush of the beautiful Leguminous *Amherstia nobilis,* already mentioned, followed by two other plants of the same family, *Brownea grandiceps* and *Saraca thaipingensis*. *Brownea grandiceps* is a beautiful tree of Venezuela and *Amherstia*



CORYPHA GEBANGA. [*Photo by R. E. Holttum.*

nobilis of Tenasserim ; but the Malayan *Saraca thaipingensis* holds its own against both, not quite in grace, but in the intensity of colour which it exhibits when in flower. The purple shades of its new foliage, also, are striking ; but this tropical phenomenon of such a colour in young leaves is possibly better illustrated by a tree of *Bouea microphylla* close to the Lower Ring Road.

The shapely trees down hill from the road are the Tembusu, *Cyrtophyllum peregrinum*. Its durable timber often serves the Malays for the head-posts and foot-posts of their graves.

There is a fine clump of the giant orchid, *Grammatophyllum speciosum*, near the Amherstia. Certain economic trees are grouped opposite the Saraca. It is here that a visitor will find the Henna tree, *Lawsonia alba*, the Nutmeg, *Myristica fragrans*, the Cinnamon, *Cinnamomum zeylanicum*, and here is a tree of *Cinnamomum Deschampsii*, which has a bark scented like Cassia bark ; but it has vile smelling flowers. The palm, with enormous leaves, is the Bornean *Corypha gebanga*, of which more will be said under the heading " Palm Valley."

The eastern half of the Office Ring Road may be said to begin with the junction of a path from the foot of the Lake. At this point stands a tree of *Michelia Champaca*. On the Lawn, which is below the road, the visitor sees from another point of view the beautiful Casuarinas, which have been mentioned on p. 11, and the Araucarias. A fine Copal tree is close to the road, its spread much greater than its height. The Zanzibar copal tree, *Trachylobium verrucosum*, is a native of east Africa, and the largest mart for the export of its resin is Zanzibar. The resin dug from the soil, that is from trees long dead, is harder and more



GYRTOPHYLLUM PEREGRINUM, the Tembusu. [*Photo by J. F. Rock.*



MYRISTICA FRAGRANS, the Nutmeg tree. [*Photo by R. E. Holttum.*

valuable than fresh resin. On the same Lawn, as already recorded, is a tree of *Agathis vitiensis*. *Agathis* yields "Manila Copal"; and a glance shows what a very unlike tree it is. A little further on the visitor will see *Hymenæa courbaril*, which yields South American Copal.

On the upper side of the road is Lawn D, which was allotted some years ago, with little success, to Australian plants; many died, and there are left only *Eucalyptus citriodora*, *Eucalyptus robusta*, *Grevillea robusta*, *Casuarina glauca*, *Acacia auriculæformis*, and two other Acacias.

Of all the many Eucalypts tried in Singapore, *E. robusta* seems to be that which supports the climate most readily; it is a coast tree in its home, never spreading far inland, but found all along the low country of New South Wales and in southern Queensland. *E. intermedia* or *E. corymbosa*, which, in suitability, is a good second to it, has the same range. It exists on Lawn J. *Acacia auriculæformis* comes from the Torres Straits.

If in flower, the beauty of *Petræa rugosa* will strike the visitor.

Below the road, Lawn C is planted with a variety of trees and shrubs, the trees at present mostly small; but there is a very tall tree, towards the Main Gate, of *Pometia pinnata*. There are two grafted Rubber Trees from different selected trees, and a tree of *Schinopsis Lorentzii*, the Quebracho of the Argentine. A Teak tree, *Tectona grandis*, has been planted, but it is small; and, as Teak scarcely stands the climate, is not likely to become a large tree.

The tallest of the tall trees by the Office is *Hymenæa courbaril*, the South American Copal tree. As its age is only fifty years, it is obviously a tree of quick growth; but, unlike most quick-growing trees, it produces a hard heart-wood, reckoned in the market as good, though variable. Partly under its shade is a tree of *Sterculia carthaginis*, which twice a year sheds its leaves and stands bare for a couple of days. The small palm-like plant near it is the Panama-hat plant, *Carludovica palmata*. Panama hats are not made at Panama, but in certain remote villages of the United States of Colombia, where under particular weather conditions, women cut and prepare the leaves, dry them with great care, and weave the hats. Four women working together can make a good hat in a week, and a superfine hat may be the result of not less than six weeks' work.

By the end of the Herbarium Building is the interesting *Acacia sphærocephala*, with large thorns at the bases of the leaves, and " food-bodies " on the tips of the leaflets. In Central America, whence it comes, the thorns are made into homes by fierce ants, and the food-bodies are eaten by them. These ants permit no leaf-cutting ants to invade the tree, and, in protecting their own homes, protect it.

Near the end of the road are good plants of *Cycas Rumphii*, and at a distance of 30 yards behind may be found its ally, *Macrozamia Hopei*. Contrary to what is sometimes written in books, both sexes of Cycas branch, but the male much more readily than the female.

The Vanilla plant, *Vanilla planifolia*, climbs the stems of the palms, where this road enters the Office Gate Road. It flowers in Singapore, but unless hand-pollinated never fruits.



HYMENÆA COURBARIL (the tall tree). [*Photo by R. E. Holttum.*
ELÆIS GUINEENSIS and STERCULIA CARTHAGINIS (in front of it).
CARLUDOVICA PALMATA (by the roadside).



PANDANUS HOULLETTII. [*Photo by Mrs. I. H. Burkill.*

THE OFFICE GATE ROAD

The Office Gate Road may be looked on as a short cut to the Bandstand Hill. In the seventies, that is to say, before the development of the Palm Valley, its sides were allotted to palms and in consequence there are many along it. The best *Cælococcus carolinensis*, the best *Borassus Machadonis* and the best *Arenga undulatifolia* in the Gardens are near it.

The clump of the Orchid *Grammatophyllum speciosum* at its junction with the Main Gate Road has been in this place since 1861.

THE BANDSTAND HILL

When, in 1859, the Agri-Horticultural Society of Singapore obtained land on which to begin the Gardens, their first work was the making of a band-promenade on the highest part of it, 109 ft. above sea-level. At that time the slopes to the southward had been cleared and cultivated, but the land to the north was virgin forest, the forest limit crossing the hill top. They cut back this limit, but left on the hill certain beautiful trees, for instance, the large Jelutong, *Dyera laxiflora*, and the Monkey Jak, *Artocarpus rigida*, which are on the west side, and the *Garcinia nigrolineata* and *Artocarpus lanceæfolia*—Kandis and Keledang of the Malays—which are on the east. The effective terraces, to the south and west, were constructed between 1860 and 1862. Planted on them are ornamental rather than economic plants. But while the general features of the planting have been maintained for twenty or thirty years, the species used for bedding change, and it is only possible in this Guide to indicate what is the more permanent.

The Bandstand itself serves as a playground in the evening for small children, and for music whenever possible.

There are two Ring-roads round it, the lower broken over a short distance on the south-east. Within the upper are two palms of *Dypsis madagascariensis*, two tall palms of *Livistona altissima*, and round the Stand itself a ring of *Actinorhytis calapparia*, which having a life of only 15 years needs to be replaced often. This last palm is the Pinang sendawa of the Malays, who use its seeds medicinally. One of the two Honeysuckles bedded on the hill is *Lonicera*



ACTINORHYTIS CALAPPARIA. [*Photo by R. E. Holttum.*



COELOCOCCUS CAROLINENSIS. [*Photo by E. H. Wilson.*



DYERA LAXIFLORA. the big Jelutong Tree. [*Photo by E. H. Wilson.*



KOOMPASSIA MALACCENSIS. [*Photo by R. E. Holttum.*

japonica of China and Japan; the other is *L. macrantha* of N.E. India. The curious inverted crimson lily is the Indian *Gloriosa superba*. The Honeysuckle does not fruit. Very conspicuous from the hill, upon its northern side, are large rounded bushes of *Bougainvillæa glabra*.

The Liane Road leaves the Hill close to these. By its side are *Podocarpus imbricatus*, *Gustavia insignis* and *Gustavia gracillima*, an immature tree of *Koompassia malaccensis*—the giant "Kempas" of the forests of the Peninsula—and *Canarium rufum*. Behind them and rising higher is seen the top of a tree of *Anisoptera megistocarpa*.

More to the east stand trees of *Terminalia subspathulata*, a worthy landmark, and of the Kenanga or Ilang-Ilang, *Canangium odoratum*. The rounded tree due east is *Garcinia nigrolineata*. *Payena dasyphylla*, *Artocarpus lanceæfolia*, and a young tree of Dyera are near it. The others behind these are wild trees of Singapore, several of them being oaks. *Napoleona imperialis* is close to the Upper Ring Road. Behind it, upon the east of the Lower Ring Road, is the beautiful *Spathodea campanulata*, with scarlet flowers, which in its home in Africa are fertilised, it seems, by birds.

Towards the south, near the corner of the Office Gate Road, are trees of *Adenanthera bicolor* and *A. pavonina*, with *Peltophorum ferrugineum* behind them. Due south is a tree of the beautiful Indian Laburnum, *Cassia Fistula*.

To the west, *Artocarpus rigida* and *Dyera laxiflora* are the most conspicuous objects.

If the visitor will walk round the terraces along the path which is near their edge, he will find the Gardens' collection of Crotons or *Codiæum variegatum*. Their variety is peculiarly interesting because the Polynesians



THE GIANT ORCHID—
Grammatophyllum speciosum in flower upon the stem of a Livistona Palm.

seem to have selected and preserved many of the existing races in a way which illustrates well what a primitive culture is able to do in plant-improvement.

Over a pergola, on the south side, grows the beautiful apricot-flowered *Odontadenia speciosa,* often called *Dipladenia Harrisii.* Over another pergola, on the west side, is the fragrant *Faradaya papuana.* Under both of these climbers, steps descend to the Lower Ring Road.

Ixoras have been given places on the terraces west of the hill.

THE LOWER RING ROAD

From the pergola where *Odontadenia speciosa* grows, to the Main Gate Road, the Red-stemmed Palm, *Cyrtostachys lakka,* makes an avenue. Proceeding round the Lower Ring Road in the other direction, the visitor sees below him a small terrace ; this was the site of the first Gardens' Office. It is shaded by trees of *Delonix regia* (*Poinciana regia*) which in the Straits Settlements has the name of Flame-of-the-Forest. It is a native of Madagascar, where it was obtained in 1829, and sent widely into cultivation. Reaching India, it soon usurped the name " Gold Mohur Tree " from the much less ornamental *Cæsalpinia pulcherrima,* whose golden flowers are of the size of the Mohur coin.

Vanda Batemanni has had a place here for over forty years.

Just at the foot of the steps is the very large bush of *Bougainvillæa spectabilis,* described in the Guide Book of 1889 as magnificent ; but in old age it flowers little.

The harsh-foliaged tree next met with is the Malay Tampang, *Artocarpus Gomeziana,* which has a fruit that is eaten cooked. Next come two small trees of *Brownea coccinea.* Beyond, is a tree of *Gordonia singaporeana,* an ally of the Tea plant, large enough to furnish good durable timber. In common with the Tea plant it contains a considerable amount of tannin, so that the bark is used for curing hides and the leaves are a local remedy for diarrhœa.

The enormous flowers of *Fagræa auriculata* here attract attention ; they are creamy-white, and may even exceed a foot in diameter. Their consistency is curiously leathery, yet they last only two days. *Fagræa Ridleyi* is growing close to *F. auriculata* ; it has smaller flowers. Nearby is a considerable tree of the Tampunei, or Monkey Jak, *Artocarpus rigida,* the fruits of which possess a delicious honey-flavoured pulp.



THE LIANE ROAD. [*Photo by J. F. Rock.*

On the upper side of the road there is a large tree of *Calophyllum inophyllum*. Its round, marble-like fruits are always nibbled by squirrels, which eat no more than the immature embryo, the rest, from the presence of poisonous resin, is left by them. An oil which is also present, is in the Pacific islands extracted for external use in muscular rheumatism. The genus Calophyllum is represented in the Gardens by about 5 species; this and several of the genus, under the name of Bintangor, furnish a timber greatly valued by Malays for the timbers of boats. The rounded tree, partially growing over the road at this point from the lower side, is *Bouea microphylla*, the fruits of which are edible, and the young foliage purple-flushed. Just beyond this Bouea is a young tree of one of the Brazilian Monkey-pots. It is not what it was supposed to be, namely, *Lecythis grandiflora*, and cannot be determined as it has not flowered yet. Another Lecythis is in the Gardens as a still younger tree. The genus Lecythis consists of a number of pretty, rather small, timber trees of South America, and the seeds of *L. ollaria* (and another?) are the Sapucaia nuts of commerce. The harvest is difficult to gather, the bulk of the nuts being taken by monkeys and other animals. The timber is used for bridges, railway ties, and even for cabinet work.

Where steps descend from the Bandstand Hill and the path, forking, is continued downwards, there are seen two trees, named from their remarkable fruits; one is the Sausage-tree, *Kigelia pinnata*, a native of Africa, and the other the Calabash tree, *Crescentia cujete*, a native of the West Indies and tropical America. The climate of Singapore is a little too humidly moist for either. The big Jelutong is next passed, its height is 150 ft. and its girth, below where it divides, is 19 ft. Beyond this tree a bit of jungle comes up to the path, on the edge of which stand trees of *Myristica Hookeriana*, *Payena lucida*, *Cleistanthus lævis*, *Baccaurea macrophylla*, *Adinandra dumosa* and *Ixonanthes icosandra*. The leaves of Myristica should be examined, because they carry the epiphytic fern, *Drymoglossum heterophyllum*, being sufficiently long-lived for this little plant to creep onto them from the stems, where it maintains itself permanently.

The Lower Ring Road next crosses the Liane Road, and the splendidly buttressed trunk of the *Terminalia subspathulata* is passed. In front and rather to the right are seen the breathing root-knuckles of *Garcinia nigrolineata*, the roots lying in the surface of the soil. The type-tree of *Evodia quercifolia* is just above it.

On the left, under the trees, are rockeries.



THE BUTTRESSED TRUNK OF TERMINALIA SUBSPATHULATA. [*Photo by R. E. Holttum.*

SHADE ROCKERIES

The shade rockeries were made by the simple expedient of cutting paths into the soil in natural forest, and lining them partly with sandstone and partly with coral. The mounds, so made, are allotted to different groups of plants, but ferns and selaginellas extend throughout them. Aroids are chiefly grouped in the western end and Scitamineæ in the eastern. The genus Musa is, of course, in the latter, the following species being cultivated :—*Musa Ensete* of Abyssinia ; *M. rosea* of gardens, its home unknown ; *M. coccinea* of Indo-China ; and *M. textilis* of Malaysia, this last affording Manila Hemp. The first dies after fruiting ; but the others propagate themselves, much as the sago palm does, by means of lateral shoots at the ground. When a banana has fruited, the false stem, through which the flowering stem has grown, dies slowly from the centre outwards, and the length of the period of dying enables the side shoots to establish themselves in a circle.



GARCINIA NIGROLINEATA,
showing the breathing knuckles upon the roots.

[*Photo by R. E. Holttum.*

In the Aroid section, the long aerial roots of certain species are seen with considerable effect. The shade of the rockeries enables *Caryota Rumphii* to be grown beautifully. *Couroupita guianensis,* the Cannon Ball Tree, can be seen. Its flowers are very curious. It fruits on the trunk, but not freely.

From the part devoted to the Scitamineæ steps ascend to an arch covered with the beautiful and fragrant *Camoënsia maxima.* This climber is said to be common in parts of Angola. It came into cultivation in 1873.



SHADE ROCKERIES, showing the air-roots of climbing aroids. [*Photo by R. E. Holttum.*

THE PLANT-HOUSES

The large plant-house was constructed in 1882 and the annexe in 1889. Into them plants are brought from the propagating department for exhibition as they come into flower ; and the contents are always changing in such a way as to prevent anything but a general description being given in this guide. Orchids and Begonias are shown in the annexe, and Ferns, Aroids and other shade-plants in the large house. Over the roof are trained various creepers. *Thunbergia grandiflora* and *T. laurifolia* hang their large flowers into the house, *Chonemorpha Rheedei, Odontadenia speciosa, Schlegelia parasitica, Tecoma amboinensis* and *Tecoma ceramensis* flaunt theirs in the sun outside. Among other climbers exhibited in more or less permanent positions is *Dioscorea macroura* from western Africa. In the elongated tips of its leaves are glandular chambers filled with mucilage and beneficial bacteria, which make a small amount of food for the plant.

In a small house to the north-east plants with open water reservoirs are grown under mosquito netting. Nepenthes and Bromeliads are such.

THE GARDENS' JUNGLE

The Gardens' Jungle consists of thirteen acres of nearly natural forest. To the visitor, who has no opportunity of penetrating into the great forests of the Peninsula, it affords a chance of realising the natural covering of the country ; while to the Gardens, it furnishes positions for the growth of a couple of hundred species, which could not be preserved alive without it. Among them are two or three not yet found elsewhere. To encourage interesting species a little interference has to be tolerated. The Liane Road passes through part of the Jungle, and there is a path by which a visitor may penetrate deeper (see the map).

The most lofty trees in the jungle are 150-170 ft. high, and are members of the family Dipterocarpaceæ, such as *Shorea gratissima, S. macroptera, S. rigida, Anisoptera megistocarpa,* and *Hopea micrantha.* With them are trees of other families, a little less lofty, such as *Santiria lævigata* and *Horsfieldia sucosa* ; between them are trees, which still are to be counted tall, such as *Artocarpus Scortechinii, Parishia Maingayi, Dialium Wallichii, Pygeum polystachyum, Scorodocarpus borneensis, Gonostylus Maingayi* and *Eugenia Griffithii* ; and under them smaller trees, and again, nearer to the ground, palms, ferns and the seedlings of the larger trees. Among the lesser trees are about thirty species of the family Anonaceæ.



ACROSS THE PALM VALLEY TO THE GARDENS' JUNGLE. [*Photo by Lee Bros.*



THE MARANTA AVENUE. [*Photo by J. F. Rock.*

The lofty Dipterocarps flower at uncertain intervals, and about 6-8 weeks from one of their prolific flowerings shower down a great abundance of winged fruits, which germinate immediately and cover the ground ; but some of these seedlings die at once ; others persist for a few years in the shade, and then, if they cannot " see the sky," perish also. Every big tree, in this way, sends to waste tens of thousands of progeny in the effort to leave a few descendants.

At certain seasons, the presence of oaks is made evident by a profusion of acorns of two, or perhaps three, species, but chiefly of *Quercus conocarpa*.

On the edge of the Jungle, towards the Maranta Avenue, *Gnetum Kingianum* is conspicuous.

When light is let into the Jungle, ferns get an advantage, *Nephrolepis biserrata* in the centre and *Gleichenia linearis* on the margins. The latter is apt to make a bed so dense that no seedlings can grow through it even if they can germinate.

THE PALM VALLEY

The Palm Valley is prettiest from the roads above it, but the visitor who would study the palms must be prepared to descend into it.

Palms vary greatly in size, between the little Mexican *Chamædorea humilis*, attaining scarcely one foot, and the dwarf Malayan *Pinanga acaulis* and *Licuala triphylla*, which are slightly larger, to the tall Ceroxylons, which



ONCOSPERMA TIGILLARIA, the Nibong palm. [*Photo by E. H. Wilson.*



FAN PALMS IN THE PALM VALLEY. [*Photo by J. F. Rock.*
The dome-topped tree against the sky is a Dipterocarp.

attain 175 ft., and to rattans 500 ft. long. It is said that in eastern Malaysia there are coconut palms 200 ft. high ; but this is not proved.

Except as an abnormality and in the unique genus Hyphæne, palms never branch above the level of the ground ; but many branch at or under the ground. Such branched palms are the Nibong, *Oncosperma tigillaria,* and the Red-stemmed Palm, *Cyrtostachys lakka*. The Sago Palms, *Metroxylon Sagus* and *M. Rumphii,* branch at the ground likewise. The Date Palm, *Phœnix dactylifera,* branches at the ground late in life, producing the suckers whereby all the superior races are propagated. The Coconut is typically unbranched. Some of the Rattans branch at the ground, and others not at all.

Fan and feather leaves are distributed through the family ; more rare is a leaf thrice divided as in the Caryota. The leaves are always firm, and usually live over many years ; their durability makes them good for thatching and is one reason why, in the East, they are written on ; however, students still debate how long palm-leaf manuscripts last. The leaf-blade in *Corypha gebanga* attains an area of at least 90 square feet, and of a vigorous *Lodoicea seychellarum* 80 square feet, while the compound leaf of a Caryota may cover more than 300 square feet. To cast off and to renew frequently organs of such great size would not be possible, and that is why their duration upon the plant is prolonged. If the stems are of rapid growth, as in rattans, the leaves become spaced out ; but it is far more usual in palms for the growth to be slow, and there are produced, in consequence, the crowns of leaves, which, at the top of stately trunks, are often so beautiful.

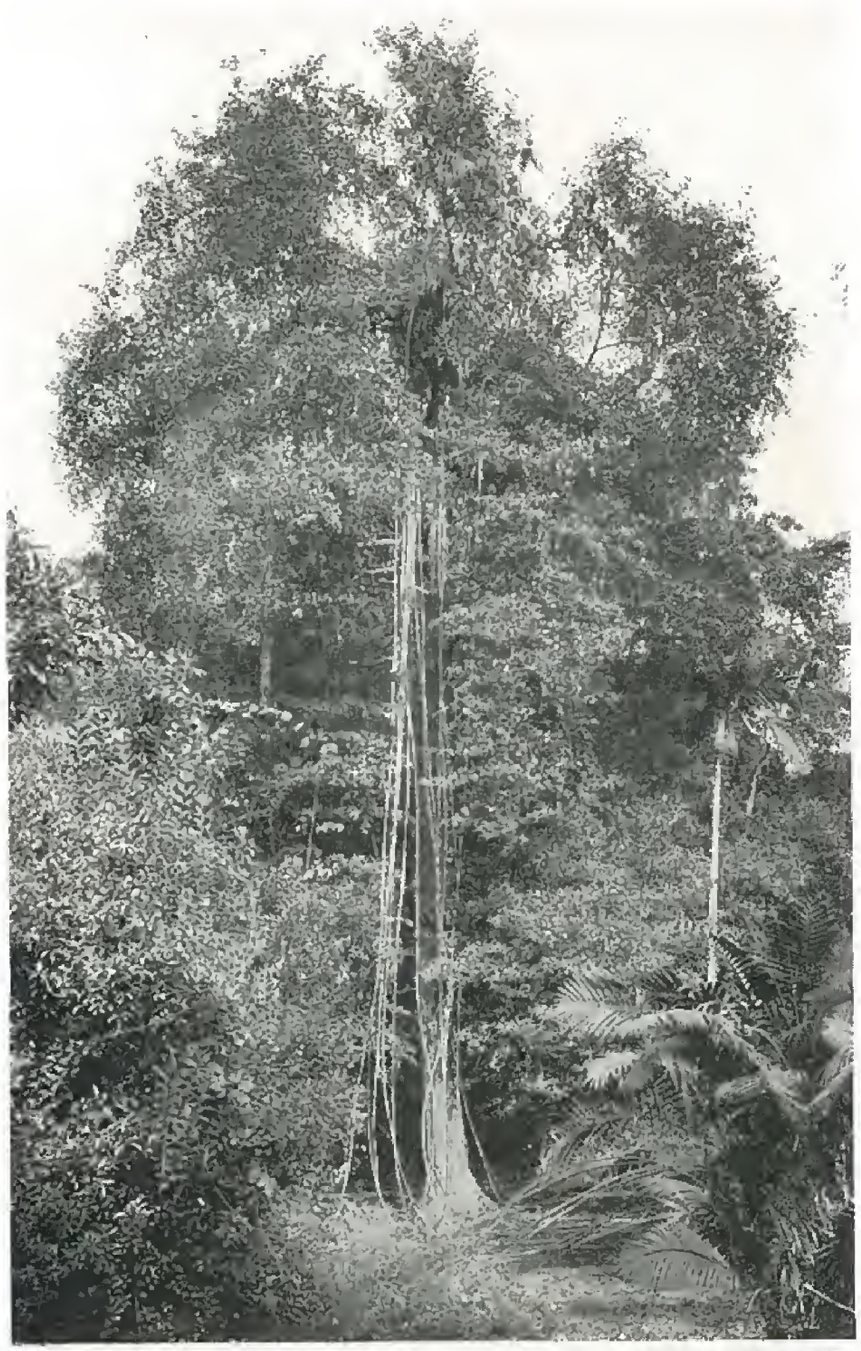
Wallichia disticha has its leaves in two rows.

The leaf-blades are carried at various angles, and sometimes, as in Attalea, edgewise towards the light, or in Rhopaloblaste, with the pinnæ pendulous. Those of *Copernicia cerifera* are coated with a wax which is commercial.

The outer part of the trunk is usually made of very hard wood, and is useful in various ways ; while the thinner stems make good walking sticks, e.g., *Ptychoraphis singaporensis,* which finds a local use, and *Rhapis flabellifolia,* which is exported from southern China as the " partridge cane." The growing point, or cabbage, of most palms is edible, and of some a great delicacy. Even the small cabbage of certain rattans is used. Toddy made from the wild date, and a few other species of palm, is sugary sap drawn from this cabbage ; but it is generally more convenient to draw the sap, not by cuts into the cabbage, but by cutting its side shoots which bear the flowers. This is the way in which the coconut, *Arenga saccharifera,* and Nipa palms are tapped. A century ago all the sugar consumed in the Malay Peninsula came from the Arenga. The sugar is, of course, nutriment for the production of new tissues and chiefly for the growth of the seed ; therefore tapping comes towards seed-time.

The grapples of the rattan, consisting of long thorny whips, are in some species the end part of the leaves, and in others sterilised flower-stems. They are wonderfully efficient, so that a rattan seldom fails to maintain a place in the sun.

The length of the life of a palm tree varies greatly. The betel palm fruits at 5-6 years of age and lives to 30. The sugar palm, *Arenga saccharifera,* fruits at 10 years and lives to 12. The coconut fruits at 5-8 years, according to



RATTANS, CLIMBING INTO A TREE OF CYRTOPHYLLUM PEREGRINUM. [*Photo by J. F. Rock.*



ARECA CATECHU, THE BETEL PALM. [*Photo by E. H. Wilson.*

the variety, or if neglected, at 15 years, when otherwise it should be at full bearing; it lives to 100 years, but is sterile probably over the last 30-40. The sago palm, so to speak, lives for ever, but its trunks last only 15 years.

The flowers of all palms are small and inconspicuous; for the most part they are insect-fertilised, and that quite efficiently. The family clings with marked persistency to the production of three ovules, and the maturing of one seed. Most species flower over a long period; but the Coryphas flower once only in their lifetime of 30-40 years and die after seed-production: this flowering lasts 3-4 weeks. Palms, in their fruits, exhibit great variety. The fruit-wall is fleshy in the Date, oily in the Elæis, fibrous in the Coconut and in a great many other palms; in the Arengas it is so full of irritant crystals as to be poisonous. The seed is oily in the Coconut, in Elæis and Attalea. In many species it is edible; that of Borassus is eaten like the coconut; that of Arenga, before maturity, is boiled in syrup and made into a sweetmeat; that of Zalacca is a favourite food among the Malays. Again, it is sometimes exceedingly hard, as in Phytelephas, the Vegetable ivory, and is turned into buttons, etc.

It forms a spice in *Areca Catechu*, the Betel palm; and substitutes for betel are got from other species of Areca, from Pinanga, Actinorhytis, Didymophlœus, Gonophyllum, Oncosperma and Calyptrocalyx. The Malays use the seeds of *Actinorhytis calapparia* as a medicine.

A little edible pulp surrounds the seeds of some rattans; and in others there is an exudation from the seed-coat, which, drying into a powder, rich in tannin, makes "dragon's blood."

Palms are essentially tropical plants, or if they extend beyond the Tropics they do so in about the same measure

as rice cultivation. Some of them withstand a winter in which the average monthly temperature gets as low as 6° C., if the summer temperature equals that of the Tropics. Some, which so extend, when grown in Singapore, do not fruit ; and *Rhapis flabelliformis,* whose home is Japan, does not even flower. They are more common in the wet than in the dry Tropics ; but some are desert plants. These last are hard to grow in Singapore. The Date is one of them ; but it will attain a fair size, without fruiting.

Economically the Palmæ are very important. The Coconut goes far towards supplying the worlds' demand for a vegetable oil ; and the Date feeds a nation. Sago is a product of first importance. The amount of sugar that palms yield is considerable. Then there are the rattans, exported for basket work, the seating of cane chairs, etc., or used for the rigging of small boats, etc. There is a fibre got from the coconut, the Arengas and other palms, and formerly all the native craft that came into Singapore from the Malaysian Islands were rigged with Arenga rope. The roofing material of the Peninsula is the " atap " made from the leaf, either of *Nipa fruticans* or *Metroxylon Sagus* or some other palm. The leaves shredded or cut into strips give materials for basket work or mats, raphia fibre being such. The very young leaves of certain palms are prepared to serve as wrappers for cigarettes.

The whereabouts of certain of these interesting palms will next be given in alphabetical order :—

Actinorhytis calapparia, the Pinang sendawa, graces the Bandstand.

Areca Catechu, the Betel Palm, is best seen near the Tyersal Gate, but is also elsewhere.

Areca glandiformis, a substitute for the above, is at the Six-ways.

Arenga saccharifera, the Sugar Palm, constitutes the Tyersal Gate Avenue.

Astrocaryum tucumoides, one of the Murumuru palms of the Amazon, is at the lower end of the New Circle path.

Attalea cohune is in four places in the Gardens, (1) on the Main Gate Road, (2) north west of the Office, (3) immediately west of the Six-ways, (4) at the bottom of the Palm Valley. In this last place it has flowered.

Borassus flabellifer, the Lontar, from which palm-books are made, occurs close to the Dalvey Gate Road.

Borassus Machadonis is near to it, and also by the Plant House.

Calamus Scipionum, the Malacca Cane, is well seen on Lawn F and at the top of the Palm Valley.

Calyptrocalyx spicatus, a substitute for Betel, is north-west of the Six-ways.

Caryota urens, a source of Sago, is close to the Office Gate Road. *C. mitis,* with the same use, is best seen close to the Dalvey Road Gate. *C. Rumphii* is good in the Shade Rockeries (section for Scitamineæ).

Cocos nucifera, the Coconut, is near the Office.

Cœlococcus carolinensis, from the Caroline Islands, stands between the Bandstand and the Plant-houses.

Copernicia cerifera, the Carnauba wax-palm, is near the Dalvey Gate Road.



RHOPALOBLASTE AND ROYAL PALMS. [*Photo by Lee Bros.*

Corypha gebanga is best developed near the Office.

Cyrtostachys lakka, the Sealing Wax Palm or Pinang Rajah, is at the Six-ways and makes an avenue on the Lower Ring Road.

Dæmonorhops verticillaris is in the upper part of the Palm Valley.

Hyphæne indica, a representative of the only genus of palm which habitually branches high up, is at the top of the Sun-rockery, but is at present very young.

Lodoicea seychellarum, the Double-coconut, is represented by a young plant on the side of the Lake on Lawn F.

Metroxylon Sagus, the Sago Palm, is best seen near the Main Gate on Lawn A. *M. Rumphii* is in the Dell.

Oncosperma tigillaria, the Nibong Palm, stands in beautiful clumps on the islet in the Lake, near to the Plant-houses and on the edge of the Palm Valley Road.

Oreodoxa : see *Roystonea*.

Phœnix dactylifera, the Date Palm, is at present only represented by quite small plants. *P. sylvestris, P. zeylanica, P. Hanceana* and *P. reclinata* stand near the Office Gate Road on either side and in the lower part of the Palm Valley.

Plectocomia Griffithii is a very big rattan, seen easily in the Gardens' Jungle ; at maturity it flowers and then dies.

Ptychoraphis singaporensis is best seen about the Shade Rockeries (Aroid section).

Raphia ruffia is best seen near the Dalvey Road Gate.

Rhapis flabelliformis, the source of Partridge Canes, is in many parts of the Gardens, notably on the Bandstand Hill by the Upper Ring Road.

Rhopaloblaste hexandra lines the Lake-side Path near the Six-ways.

Roystonea regia, the true Royal Palm, with a stem slightly cigar-shaped in its upper half, occurs in many parts of the Gardens, notably near the Palm Valley Road and upon the Bandstand Hill. *R. oleracea*, the Cabbage Palm, with the trunk cylindrical, stands up out of the Plant-houses.

Wallichia disticha is on Lawn K and on the south-west side of the Dell.

Zalacca edulis is in the upper part of the Palm Valley.

THE LOWER NURSERY

The Lower Nursery exists for raising stock, and the Sales List is more or less a catalogue of its contents. They need not be described here, but it is well to remark upon the occurrence of certain trees on the border of it. On the east side Rattans have been planted. At the head is a fine clump of *Dendrocalamus giganteus*; and near it the Cacao Tree, *Theobroma Cacao*, grows well. The pods are carried on the trunk and thicker branches. Towards the lower end of the Nursery is *Parkia Roxburghii*, a tall graceful feathery-leaved tree. Near it is a clump of the Screw-pine, *Pandanus labyrinthicus*, with a path cut through so as to show how well it merits its second name from the tangle which its air-roots make.

On the other side of the road at this point attention should be directed to the clump of *Montrichardia aculeata*. This tall Arum Lily lines the shores of the Amazon and other South American rivers, and grows well in Singapore, though flowering little; whereas the African Arum Lilies, of European greenhouses (Richardia spp.), will not thrive in Singapore.

THE NEW CIRCLE

The New Circle is a path which takes off from the Palm Valley Road at its lower end and, curving through Lawn Z, comes out on Lawn R at the top of the Palm Valley. The part of the Gardens in which it is, was not part of the original 56 acres obtained in 1859 by the Agri-Horticultural Society, but was purchased in 1866. For a variety of reasons its development was hindered, and much of the planting therein dates only from 1919.

At the Nursery end the path is level for a hundred yards. On the right hand side of it rise two trees of *Shorea bracteolata*, close to which *Vatica Wallichii* has been planted and the palm *Astrocaryum tucumoides* of the Amazons raises its foliage high.

On the left hand side *Bombax larutense* is planted, and near it may be seen *Balsamocitrus paniculata* and *Casimiroa edulis*. These two are allies of the oranges, the first is African and the second American. The leaves of Casimiroa are medicinal; its fruit is unwholesome and soporific. The more useful and allied *Aegle marmelos*, Bel-fruit tree, will be found planted higher up the hill.

The African Baobab, *Adansonia digitata*, is placed here so as to be near its ally *Bombax larutense*. It makes, perhaps, the most bulky tree of the whole earth, producing a trunk of soft wood, that may exceed 150 ft. in circumference. Its tough bark serves for cordage ; its acid fruits are used as seasoning ; and its wood can be converted into paper-pulp. It has flowered in Singapore, but not this individual which is very young.

Over the slope, just where the path begins its ascent, is a patch of the fibre-pineapple ; this is a variety with long leaves and indifferent fruit. When the Pineapple was brought first to the East from America, its fibre was commercially more important than its fruit.

Hura crepitans, an American plant, with the purgative properties of Castor Oil, and in times past a substitute, is on the slope. Its fruits explode in the same way as those of the Para-rubber tree, but with greater violence, and with a noise that has earned for it the quaint name of " the Monkey's dinner bell."

Myroxylon balsamiferum is planted here. It is the source of both Balsam of Peru and Balsam of Tolu, in varieties that differ only in their resins. Balsam of Peru is obtained in the hills behind the southern coasts of the Central American States of San Salvador and Guatemala. Balsam of Tolu is obtained in the South American States of Venezuela, Colombia, New Grenada and just into Ecuador. There was an Indian industry in the balsam when the Spaniards reached America ; and at the time when they introduced it among the medicines of Europe, " Peru " indicated much more territory than it does now. Trees, well grown, may exceed 100 ft. in height.

Not far away, is a bush of *Merrillia caloxylon*, the source of a beautiful yellow and brown wood, valued by the Malays for kris sheaths. It makes a good furniture wood.

A little further up the hill is a tree of the Japanese loquat, *Eriobotrya japonica*, interesting as one of the few trees that will grow out of doors in the south of England and put up with the unlike climate of Singapore. It flowers in Singapore, but never fruits. It likewise flowers in England, where fruits can be obtained if the tree is protected while they ripen. Without doubt, it lays down its flower-buds during the warmest part of the Japanese summer or in the warmth of the middle of the year in northern India, for it flowers in these places in November ; but it requires relatively low temperatures for setting fruit, such as are never attained in Singapore. Could one keep ice about it, after flowering, perhaps it would fruit in Singapore, too.

The large-leaved tree nearby is the Philippine Marang, *Artocarpus odoratissima* ; it is considered superior to the Chempedak and similar Artocarps. It has begun to fruit in Singapore.

Two species of Strophanthus are planted at this point. Their curious flowers, with long tails to each of the five lobes of the corolla, attract the eye. One of them is *Strophanthus hispidus*, and the other is *S. Petersianus* ; both are



ASTROCARYUM TUCUMOIDES. [*Photo by Lee Bros.*

African. The Manganja negroes of the Zambesi use Strophanthus poison on their arrows ; and in 1861, Sir John Kirk, as the result of receiving a slight wound, perceived that it could have a place in medicine for its effect on the heart. In consequence of his efforts, its toxicology was studied in Edinburgh, and it became an official drug. The Pharmacopœias usually define the drug as derived from *Strophanthus Kombe* ; but *S. hispidus,* which occurs on the Guinea Coast, is almost, if not quite, the same thing. *S. dichotomus* of Burma and Malaya will be found planted nearby.

Of *Bouea microphylla* mention has already been made on p. 38. *Bouea macrophylla* is planted on Lawn Z ; it is the Kundangan of the Malays, and gives a good fruit, better known in Malacca than in Singapore. The allied Hog-plum, *Spondias mangifera,* is a tree growing close to it. There are many races of the Hog-plum, and if carefully selected, something might be got out of it worth preserving. The fruit is in appearance like a mango, and the tree is of the same family.

Picralima Klaineana, a moderate sized tree of the Guinea Coast, with intense bitterness in its leaves and fruit, is planted near. The negroes of West Africa resort to it as a tonic at the end of a fatiguing day.

Garcinia cochinchinensis follows ; it has acid fruits and is cultivated for them in Cochin China. Nearby are two species of Caryocar, *C. villosum* standing below the path and *C. nuciferum* above. They are considerable trees of South America, with timber that appears to be durable as well as possessing other good qualities. They produce excellent nuts, which are at present rarely exported on account of the difficulty of getting them to the coast. The oil of these nuts is bland like almond oil.

The Indian Sal Tree, *Shorea robusta,* is on the slope a little higher. In the climate of Singapore, it produces a swollen and gorged bark which ruptures and is obviously unhealthy, so that this most useful timber tree has no chance of long survival here.

Sapium Aucuparium is near it ; once it was thought a possible rubber tree, but what it yields is no more than bird-lime.

Behind are two trees of the Brazil Nut, *Bertholletia excelsa.* This useful tree grows well in Malaya, and in the Economic Garden used to bear freely where two individuals were planted together. It has not been proved, but it is thought possible that fertilisation from a separate plant may be necessary with it.

Bombax malabaricum is placed here ; it is a tree which furnishes a kind of kapok. In India, its soft perishable timber is largely used for making boxes for packing tea for export.

Well above the path, the Durian Tree, *Durio zibethinus,* is seen in perfection, and at the right season there is generally a fair supply of the prickly fruits.



THE MONKEY BRIDGE OF ENTADA SPIRALIS. [Photo by Lee Bros.

South of these durians, towards the Director's house, is grown the Avocado Pear, *Persea gratissima*, in two or three races ; and north of them, as well as south of the path, the Brazil Cherry, *Eugenia brasiliensis*. Both are excellent fruit trees for this country ; the one fruits at about 7 years, and the other at 6 years. Of the Avocado Pear there are many races, which have been classed into three groups, the Mexican, the Guatemalan and the West Indian. For the Straits the most tropical races are required.

The Cinghalese *Eugenia Mooniana* has been planted upon this Lawn, It is a tree which furnishes the black carrying sticks so extensively used in Ceylon, the colour being a result of burying them for a time in mud.

Well up the slope, near the durians, the tallest tree is *Alstonia angustifolia*. This particular tree bears the marks of tapping, done to ascertain the nature of its latex, which solidifies to something like jelutong.

Cola caricifolia occurs near the path ; it is not one of the more important Colas in trade.

Canarium commune has been planted here ; and there is a striking tree of *Artocarpus superba*. This latter species is confined to Singapore, Bangka and Borneo ; and its most noteworthy feature is its very large divided leaves.

Pouteria suavis, an ally of the Sapodillo or Buah Chiku, reported as possessing a pear-like fruit with a delicate flavour, is represented here. It comes from Uruguay, where under the name of Aguya it is much eaten.

Muntingia calabura occurs at the crest of the rise. It is a West Indian fruit tree, which the Spaniards brought into the Philippines. Comparatively recently, it has been brought from thence to the Straits, chiefly through Siam. The fruits are small yellow balls, and are good for preserves.

Quassia amara, a bush with pretty pink flowers, and formerly the source of the bitter drug of that name, may be seen here.

Vitex Volkensii, an African febrifuge, is planted at this place also ; and the Buah Kras or Candle Nut, *Aleurites moluccana*, the Chinese oil tree, *Aleurites cordata*, as well as the Nux-vomica, *Strychnos Nux-vomica*.

Aleurites moluccana attracts attention by its silvery foliage. Its exceedingly hard nut contains much oil, but needs special machinery to crack it. Formerly through most of Malaysia, and still in certain parts, the kernels were moulded onto a splint of bamboo to make candles.

The Nutmeg, *Myristica fragrans*, and the Tonkin Bean, *Dipteryx odorata*, are planted where the path has become almost level.

The path next crosses a service road, and, passing through a belt of trees, reaches Lawn R. The belt consists of trees such as constitute Singapore secondary jungle of 50 years' standing, which have been allowed to grow up behind a row of Tembusu Trees, *Cyrtophyllum peregrinum*, planted in 1866 ; and in it palms have been put. In it, also, is a very fine example of the climber, *Entada spiralis*, and the most beautiful example in the Gardens of *Ficus irregularis*.

At the edge of Lawn R is a border containing a variety of bushes and among them stands a tree of *Macaranga hypoleuca*, every twig of which has been hollowed out by an ant, *Iridomyrmex borneensis*, which turns them into homes, and there rears, besides its young, a supply of scale insects serving as milch cows, and, in dearth, as food. The tree, apparently benefits by being ant-infested in this way, which is known as myrmecophily. Other myrmecophilous plants are to be found in the Gardens such as *Macaranga triloba* in the Jungle, *Myrmecodia tuberosa* and *Polypodium sinuosum* in the Plant-houses, *Dæmonorhops Jenkinsianus* in the Palm Valley, and *Dischidia Rafflesiana* near the Office Gate.

THE SUN ROCKERY

When the visitor emerges from the New Circle Path onto Lawn R, the Sun Rockery is on his left-hand side, at a few yards distance. Part of it is planted with Agaves, part with Aloes, part with succulent Euphorbias and part with Cacti. Of the Agaves, the most interesting is *Agave sisalana*, the Sisal Hemp plant. Its stiffly erect leaves proclaim the strength of its fibre ; they are without prickles on the margins. *A. rigida* is the counterpart with prickles. One of the Agaves has the snake-like curves of a Malay kris, and is *A. lophantha*.

Among the Aloes is *A. frutescens*, which so far makes a much smaller plant than its name indicates. *A. vera* is present. It is one only of the sources of Bitter Aloes, but the widest spread. The succulent Euphorbia, *E. Tirucalli*, the tulang-tulang of the Malays, is interesting. It is a native of Africa, and at one time it furnished a certain amount of rubber exported from Natal. It has been for a century or more in the Malay region, and is widely scattered in cultivation through the Peninsula. The Malay name means " like bones," and under the idea that plants carry indications of their uses in their appearance, the Malays treat diseases of the joints by applications of it. Such an idea gave rise to " the doctrine of the signatures of plants " of mediæval Europe.

Among the Cacti is *Opuntia cochenilifera*. As its name indicates, it was the cactus chiefly employed for rearing the Cochineal insect. Its home is Mexico, and in the 17th and 18th centuries, when the nations of Europe tried to create trade monopolies, Spain fixed a death-penalty upon bringing it out of that country. Nevertheless it was done in 1777 by an intrepid Frenchman.



THE SUN ROCKERY.
On the right, Agaves. On the left, Cacti, Euphorbias, etc.

[*Photo by R. E. Holttum.*

Opuntia monacantha is also present. It serves likewise as a food for the cochineal insect, and in so great a measure that the insect kills it. But being a native of the extreme south of Brazil, it was never used in Mexico for rearing the insect. It was taken round the world very early as a food plant, in those times when any green vegetable, even if unpalatable, was worth carrying on board ship to ward off the dreaded scurvy. Thus it has obtained a wider distribution than any other cactus. But in India, when an inferior race of the cochineal was brought in at the south, it was destroyed from all but the most remote parts.

Opuntia elatior is present also. Its abundant thorns fit it for the making of an impenetrable hedge. Such a hedge once existed in India, very many miles long, for the purpose of arresting smuggling between the East India Company's dominions and certain native States.

Here also is *Opuntia decumana*, the Barbary fig.

Epiphyllum Hookeri is one of the flat-stemmed Cacti ; it has beautiful fragrant white flowers, which open at night.

Cereus hexagonus and some other columnar species are growing satisfactorily.

At the top of the Rockery *Hyphæne indica* has been planted, in the hope that by aid of plenty of sun and good drainage it may be grown.

The Palms below the Rockery are all species described by the great Italian naturalist, Odoardo Beccari.



THE LAKE AT EVENING. [*Photo by J. F. Rock.*

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